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Further Experiments on Immediate Recall of Word Lists with the Requirement to Match List Length in Recall

by

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Introduction

A prior report (Cofer, 1961) presented a replication of a part of an experiment by Deese (1959) on immediate free recall of lists of words which were composed either of high-frequency, low-frequency, or zero-frequency associates of the list name. Deese's finding that aspects of immediate free recall of such lists are closely related to the list's inter-item associative strength was confirmed. In addition to the replication of Deese's experiment, an extension of his experiment was run in which, after they had completed their free recalls, the subjects were asked to go on writing words until their total was equal to list length. This extension of the recall period was called "forced recall". During the forced recall period the subjects added, on the average, less than one correct item to those they had already recalled, but the correlation over the 18 lists between the number of correct items added during forced recall and inter-item associative strength was 0.73. The data of chief interest in the prior study, however, were the responses added during forced recall which were not correct. Deese's interpretation of his original findings was that subjects in "recalling" wrote down their associations to the few words they actually remembered. It would seem, on this hypothesis, that, asked to match list length duringforced recall, the subjects would add responses by associating to the list name and to the list members they had already written. This expectation, however, was not realized, as the responses produced in free recall often did not include high-frequency associates either of the list name or of list members, although some of the responses produced were such associates and occurred in forced recall at frequencies the same as or even greater than their frequencies as free associates to the same words. It was suggested that a contextual factor might

have operated to make more or less available the associative responses in the recall situation.

In the present report, four additional experiments are described in which the purposes were to study factors in the instructions and other aspects of the method which might have influenced the results already described. In one, no separation was made between free and forced recall, but the instructions were to match list length. This variation was run to determine if the separation of the recall into two parts had a bearing on the results obtained. In another variation, there was no separation of free and forced recall but again the instructions were to match list length. In order to try to reduce the subject's possible set toward accuracy, however, he was assured that any words he thought of would do and he was asked to code thewords he thought of as to his certainty or uncertainty of their list membership. In the other two experiments, free and forced recall periods were separated. In one, the subject was explicitly told that he could associate to the list name and in the other to the list members in his process of matching list length during forced recall.

In general, these variations on the original experiment did not seem to have any marked effects upon the kinds of responses the subjects produced in their efforts to match list length.

Method

Four small classes of psychology students were used, one for each experiment. Only six of the original lists constructed by Deese were employed in these experiments, and the same six lists were used for each group. The lists were numbers 1, 4, 14, 17, 9, and 12 (Deese, 1959, Table 1, p.307), presented in that order. Lists 1 and 4 are composed of the high-frequency associates of Butterfly and of Slow,

[illegible]

Chair, respectively, and [illegible] of [illegible] associates of *Music* and *Whistle*, respectively.

E gave the [illegible] that [illegible] presented each list and its name as he had done in the [illegible] experiment (Deese, 1961, pp. 2-3). S wrote down the list name, listened to the list presentation, and then wrote his recall. Where [illegible] recall was used, it was carried out as described in the previous report. The variations introduced were as follows:

Group IC. [illegible] (Deese, 1959, pp. 306-307) but both before and after [illegible] before and after each list was read [illegible] that there would be [illegible] items of the list and that S was to produce 15 [illegible] whether or not he was sure that the words he put down were on the list. He was told that he could use any ones at all [illegible] to [illegible] of 15. No separation of [illegible] recalls was introduced [illegible].

In Group [illegible], [illegible] forced recall [illegible] at the beginning of forced recall [illegible] his total was [illegible] and to use the [illegible] in doing so. He was told [illegible] original [illegible].

In Group [illegible] in [illegible], except that S was [illegible] recall [illegible].

[illegible] Group [illegible] recall of the list, [illegible] forming [illegible] strict [illegible] S [illegible] would [illegible] list, [illegible] he [illegible].

Table 1

Correct Responses and Intrusions during Free Recall
and Correct Responses during Forced Recall

Group	List	Free Recall		Forced Recall
		Correct	Intrusions	Correct
IC	[illegible](1)	12.09	2.90	--
IIC	HF(1)	10.25	0.5[illegible]	0.850
IIIC	HF(1)	9.33	0.22	1.110
IVC	HF(1)	12.00	3.00	--
IC	HF(4)	10.09	[illegible].90	--
IIC	HF(4)	9.85	0.50	1.125
IIIC	HF(4)	8.11	0.67	0.970
IVC	HF(4)	10.41	4.66	--
IC	LF(14)	8.[illegible]	5.90	--
IIC	LF(14)	8.75	1.25	0.625
IIIC	LF(14)	6.89	0.44	0.330
IVC	LF(14)	8.25	7.07	--
IC	LF(17)	9.36	5.63	--
IIC	LF(17)	10.25	1.[illegible]	0.375
IIIC	LF(17)	9.33	1.[illegible]	0.330
IVC	LF(17)	11.41	3.7[illegible]	--
IC	ZF(9)	9.[illegible]	5.90	--
IIC	ZF(9)	9.65	0.375	0.250
IIIC	ZF(9)	7.33	0.56	0.110
IVC	ZF(9)	8.75	5.25	--
IC	ZF(12)	8.36	6.63	--
IIC	ZF(12)	8.75	0.50	0.000
IIIC	ZF(12)	7.00	0.56	0.110
IVC	ZF(12)	8.58	6.66	--

A total of 40 subjects were run, 11 in IC, 8 in IIC, 9 in IIIC, and 12 in IVC. The lists used for these 4 groups were the same as those used for Group I (N of 17) in the first experiment (Cofer, 1961).

Results

Table 1 shows mean results for each group and each list for number of correct responses in free and forced recall and intrusions during free recall. (The higher means for free recall for correct responses and intrusions in groups IC and IVC than for IIC and IIIC are due to the facts that the correct responses during forced recall are indicated separately for the latter two groups and that their intrusions in forced recall are not shown in Table 1.) These data resemble those reported by Deese (1959) and Cofer (1961) for comparable measures.

The free associative response distributions to the list members (Deese, personal communication) were examined in order to discover which responses appeared in forced recall and at what frequencies; similarly the associative responses to the list names were examined. There were no evident differences in the responses of the 4 groups in this experiment - the experimental manipulations were not effective in altering the pattern of results either among these groups or in comparison with the results reported earlier. Accordingly, the data for all four groups have been combined, and tabulations for one list at each level of association are shown in Tables 2, 3, and 4. Table 5 shows corresponding data for 57 subjects for the high frequency Butterfly list; this includes the 40 cases of the present experiments and the 17 cases of the relevant group from the earlier experiment.

Table 3 shows the list members for the low-frequency Chair list, their associates which occur with a frequency of 10% or greater in Deese's norms (or the Kent-Rosanoff norms), the frequencies of the occurrence of the associates in recall (free for groups IC and IVC and forced for groups IIC and IIIC), and the frequency with which the list

Table 3

Free Association Responses with Frequency of 10% or Greater to List Members of the High-Frequency Slow List and their Frequency in Free or Forced Recall for all Groups Combined. List Members presented in Alphabetical Order in Table*

List Member	Associative Frequency (N=50)	Forced Recall or Intrusion Frequency (N=40)	Frequency of Accurate Recall of List Member (N=40)
Down	up(37)	5	37
Drive	car(19), go(5)	6, 4	19
Fast	slow(34)	-	28
Lazy	tired(11), sleep(y)(6)	, 2	23
Poke	stick(9), hit(5)	0, 0	35
Quick	fast(24), slow(12)	-, -	26
Run	fast(15), walk(1[illegible])	-, -	30
Sign	post(6), road(5) stop(5)	0, 2, -	21
Skid	slide(11), car(10), row(6)	4, 6, 0	29
Snail	slow(27), crawl(5)	-, 2	29
Speed	fast(21), car(s)(11)	-, 6	27
Stop	go(28)	4	16
Traffic	light(10), car(s)(8), jam(6), cop(5)	3, 6, 1, 0	36
Walk	run(25)	-	34
Work	hard(20), play(12)	1, 1	17

*The number replaced by a dash indicates that the associate to a list member is also a list member.

Table [illegible]

Free Association Responses with Frequency of .01 or Greater to List Members of the Low-Frequency Chair List and their Frequency in Free or Forced Recall for all Groups Combined. List Members presented in Alphabetical Order in Table[a]

List Member	Associative Frequency (N=50)	Forced Recall or Intrusion Frequency (N=40)	Frequency of Accurate Recall of List Member (N=40)
[illegible]	dress(3), [illegible]	[illegible], 0	24
[illegible]	bed(10), sofa([illegible]), soft(5), sleep(5)	[illegible]	24
Cozy	warm([illegible])	0	22
Glue	stick([illegible]) [illegible]	2	[illegible]
Hard	soft(34)	13	[illegible]
High**	low([illegible])	5	[illegible]
Lazy	tired([illegible]), sleepy(6)	1, 3	[illegible]
Modern	[illegible]	0, 0, 1	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]**	[illegible]	[illegible]	

[illegible]

** [illegible]

[illegible] As associates to cloth, dress occurs 16% and [illegible]es 12% of the time in Deese's norms, but neither occurs in recall despite the fact that cloth is recalled by 24 of the 40 subjects. Warm, a frequent associate (3.[illegible]%) of cozy, does not occur in recall, although 22 Ss recall cozy. A number of other similar cases occur, along with cases in which the associate, while occurring, does so at a low frequency as compared with the norm frequency (e.g., book to study, 16% in the norms, in recall only 5% of the times that study is recalled; large to small, [illegible]% in the norms, in recall only 13% of the times that small is recalled). High frequency items to the list name (chair) in the norms are table (49%) and sit (20%); these occur, respectively, 12.5% and 7% of the times in recall. On the other hand, certain associates appear at even a higher frequency in the recalls than they do in the norms. Examples are sofa and soft, responses to couch and soft (also a response to hard).

An even more definite failure of the associates to list members to appear in recall is seen in Table 4, in the case of the zero-frequency list, music. No list-member associate occurs in recall at anything like its frequency of occurrence in free association. List name associates do occur. Their frequencies in the norms are at 10% for song, 17% for notes, 12% for sound, and [illegible]% for piano. Corresponding percentages of occurrence in recall are [illegible]%, 17.5%, 7%, and 10%.

In Table 2 and Table 5 similar findings occur, although the data are limited because so many of the list-member associates are also list members. Striking examples of reduced frequency are, in Table 2, stick and [illegible] (associates to joke), hard and play (associates to work). Increased frequencies also occur, as represented by car (associate to drive, ski[illegible], speed, and traffic).

The comments just made parallel those made in the earlier report ([illegible], 19[illegible], pp. [illegible]-7) for data from different subjects, different lists,

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
abstract	[illegible]	[illegible]	1
body			[illegible]
check	[illegible]	[illegible]	[illegible]
desert	[illegible]	[illegible]	[illegible]
depth	[illegible]	[illegible]	[illegible]
determine	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	11
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

Table 5

Free Association Responses with Frequency of 10% or Greater to List Members of the [illegible] Butterfly List and their Frequency in Free or Forced Recall for all Groups Combined. List Members are Ordered in Alphabetical Order in Table*

List Member	Associates (Frequency) (N=57)	Forced Recall Intrusion Frequency (N=57)	Frequency of Accurate Recall of List Members (N=57)
Bees	[illegible] honey(10), birds(9), buzz(7)	[illegible]	32
Bird	fly(15), dog(5)	[illegible]	23
Blue	red(13), sky, color(7)	[illegible]	34
Bug	[illegible]	[illegible]	25
Cartoon	[illegible]	[illegible]	39
Color	[illegible]	[illegible]	20
Flower	[illegible]	[illegible]	20
Fly	[illegible]	[illegible]	31
Insect	bug(11), fly(9)	[illegible]	36
Moth	fly(10), ball(8), cloth(6), bug(5)	[illegible]	40
Net	[illegible]	[illegible]	17
Pretty	girl, [illegible]	[illegible]	27
Stomach	[illegible]	[illegible]	30
Wing	bird, fly	[illegible]	34
Yellow	red, [illegible]	[illegible]	36

*The number replaced by a dash indicates that the associate to a list member is also a list member.

And [illegible] conditions [illegible] justified, then, to [illegible] a simple associative conception of the recall [illegible] is inadequate as a conception for recall under the conditions of these experiments, some sort of selective process, perhaps identifiable with the contextual character of the list, seems to be at work. The data for the zero-frequency list, in which the contextual factor (aside from the list name) is probably least pronounced, show a surprising lack of use of associates of list members in recall, however. It is possible, though, that the list name may be the contextual factor here.

Data were obtained in Group IVC on the accuracy with which subjects know the list membership of the words they wrote down. Table 6 summarizes these data.

Table 6

Accuracy of Identification of Words as List Members

(Group IVC)

List	% Correct Identification when Word was Right	% Correct Identification when Word was Wrong
HF(1)	91	77
HF(4)	90	64
LF(14)	9[illegible]	70
LF(17)	9[illegible]	[illegible]0
ZF(9)	96	76
ZF(12)	9[illegible]	65
Mean	93.33	68.67

These data show that subjects are highly accurate in judging which of their recalled words were in fact on the list. Less accurate, but still high, is their judgment that a word "recalled" was not on the list. Both errors and uncertain judgments were much higher in the latter case than in the judgments about correct words.

Findings such as this suggest that subjects are at least sufficiently aware of what words they think of were on the list or not that an editing process could be invoked to account for their general failure

to associate freely to the list name or the list members as they "recall". An occasional subject was found who did state that he thought of an associate of a list member but did not record it because he knew it had not been on the list. On the other hand, since reports of this kind were infrequent it is uncertain that a generalization to this effect is appropriate.

The behavior of the subjects, typically, can be described as that of quickly writing down a number of words and then stopping. It is as if the memory bank were empty at the point of stopping, as if there is no more to be remembered no matter how much effort is given the task. If additional words do arise at this point, they are probably edited as to probable list membership. Associative interrelations can apparently increase the number of words that will be produced, but it does not seem accurate to say that subjects go on associating unselectively until they have written enough words to satisfy themselves that they have complied with the experimenter's task.

Summary

A number of different experimental arrangements were introduced in order to study editing and associative processes in the immediate free-recall of 15-item lists of words. None of these arrangements produced data differing substantially from those reported earlier (Cofer, 1961) and the conclusions of the earlier report seem to be warranted.

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